CHANGE SUMMARY
NITF2.0 to NITF2.1

1 PURPOSE.

This document provides a summary of the changes (to date) in NITF version 2.1 (draft) as compared with NITF version 2.0.

1.1 SCOPE: In addition to highlighting specification differences between NITF2.1 (Draft) and NITF2.0, this document includes information about anticipated changes in community implementation agreements and compliance test criteria.

1.2 APPLICABILITY: This document is intended to be an informative aid to those parties planning to upgrade existing NITF2.0 implementations and/or those implementing NITF for the first time. Once published, the NITF2.1 standard, related standards and profiles, and certification test documents become the normative documentation for implementation.

1.3 LIMITATIONS: No attempt has yet been made to develop a sample implementation of NITF2.1. Although an effort has been made to be comprehensive in comparing NITF2.1 with NITF2.0, past experience indicates that additional nuances will be discovered by the first attempts to implement to the updated standard.

1.4 REFERENCES:

1.4.1 Mil-Std-2500A National Imagery Transmission Format (Version 2.0) for the National Imagery Transmission Format Standard, 12 October 1994

1.4.2 Mil-Std-2500B National Imagery Transmission Format (Version 2.1) for the National Imagery Transmission Format Standard (DRAFT),

1.4.3 STANAG 4545 NATO Secondary Imagery Format (Edition Study Draft 0.9), undated.

1.4.4 ISO 12087-5 Basic Imagery Interchange Format (BIIF),

1.4.5 JIEO Circ. 9008 NITFS Certification Test and Evaluation Program Plan,

1.5 BACKGROUND: There is an ongoing effort to develop an international standard (ISO 12087-5 BIIF) based on the past experience and capabilities of NITF. Significant interest has been displayed by other nations to adopt the basic structure and capabilities of NITF as a common format for the exchange of imagery products. For

example, countries associated with the North Atlantic Treaty Organization (NATO) have nominated NITF as the basis for exchanging secondary imagery among those allies.

Ideally, the approach would be for the US, NATO, and other interested entities (e.g. medical, law enforcement, agriculture, etc.) to develop and register profiles of the international standard for use in acquisition and implementation. Since the international standard is not yet finalized, the interim approach is to document intended usage as a military standard in the US (Mil-Std-2500B) and as a Standardization Agreement (STANAG 4545) in the NATO arena. This approach provides documentation suitable for acquisition purposes while the community awaits for ISO 12087-5 to at least become established as a Draft International Standard (DIS).

Once the ISO standard is established, Mil-Std-2500B and STANAG 4545 can be replaced by a registered profile(s) of ISO 12087-5. In the meantime, every effort has been made to keep the Mil-Std-2500B and STANAG 4545 draft documents in technical synchronization, both mutually and with the evolving draft of ISO 12087-5.

To ease the transition of systems fielded with NITF2.0, significant effort has been made to posture BIIF, NITF2.1 and NSIF specifications such that an implementation profile of these specifications could be essentially equal to NITF2.0 at the binary file level. This goal has been met with just a few minor exceptions as detailed below.

1.6 Transition. As implementations transition from NITF2.0 to NITF2.1, there will be a need to maintain backward compatibility with NITF2.0. This will allow continued interoperability with legacy 2.0 systems that have not yet transitioned and provide access to the vast number of archived 2.0 formatted files. Implementors should provide an easy mechanism for users to limit file generation to NITF2.0 constraints when operationally needed.

2 DELETED FEATURES, CAPABILITIES, AND CONSTRAINTS

The following paragraphs identify the features, capabilities, and implementation constraints of NITF2.0 that are no longer applicable once NITF2.1 becomes mandatory for implementation.

2.1 NITF1.1. There is no longer a mandatory requirement for full NITF1.1 backward compatibility. However, NITF2.1 implementors should consider continued support for the interpretation of legacy NITF1.1 files that may be archived.

2.2 ARIDPCM. The ARIDPCM compression algorithm is no longer used except as it may appear in archived NITF1.1 files.

2.3 File Size Constraints. The following file size constraints imposed on NITF2.0 implementations are eliminated for NITF2.1 files:

2.3.1 Maximum file size limitation for compliance level 01 files of 1.2 megabytes.

2.3.2 Maximum file size limitation for compliance level 06 files of 2 gigabytes.

2.4 Display Level Constraint. The constraint that the image, symbol, or label segment with the lowest display level must be positioned at the origin of the common coordinate system has been eliminated for NITF2.1 files.

2.5 Pre-Positioned Default JPEG Tables. The use of the Compression Rate (COMRAT) field to designate pre-positioned default Quantization and Huffman tables has been eliminated. JPEG tables will always be included as part of the compressed image. For implementations lacking the ability to generate tables customized for specific images, a set of 'default tables' for different image types (VIS, SAR, IR, Color) has been defined in the standard. The appropriate default tables are to be included in the JPEG stream when custom tables are not available.

2.6 Symbol Segments. The use of the "SYMBOL" segment construct is now constrained to use only Computer Graphics Metafile (CGM) encoded symbols.

2.6.1 Raster or Bit-mapped symbol segments are no longer supported. The equivalent functional capability can be accomplished by using the bi-level (single bit-per-pixel) raster image capability of the "IMAGE" segment construct. This also allows for Bi-Level compression of a bit-mapped raster not previously supported for bit-mapped symbols.

2.6.2 There is no longer a reference to, or anticipation of, the future use of "OBJECT SYMBOLS".

2.7 Label Segments. The "LABEL" segment construct has been eliminated in NITF2.1. A place holder in the file header has been retained to preserve header structure compatibility with NITF2.0, but its use is now reserved for future purposes.

3 MODIFIED FEATURES, CAPABILITIES, AND CONSTRAINTS:

The following paragraphs identify the features, capabilities, and implementation constraints of NITF2.0 that have been modified in NITF2.1.

3.1 Header Field Types. The NITF header and subheader fields are no longer designated as being 'Required/Optional/Conditional'. They are now designated as being either 'Required' or 'Conditional'. Specification of more definitive value ranges for fields obviated the need for designating some fields as being 'optional'.

3.2 File Profile Name and Version. There is a modified convention to mark files for the applicable version of NITF. This is being done in anticipation of the proposed international standard, 12087-5 Basic Image Interchange Format (BIIF); and STANAG

4545, NATO Secondary Imagery Format (NSIF). The first nine characters (bytes) of the file (the FHDR field) now portray the profile version of the underlying standard identified in the four characters (bytes) of the Standard Type (STYPE) field (previously the unused System Type field). NITF2.1 Implementations will be expected to handle the following:

"NITF01.10"	Legacy NITF Version 1.1 files.
"NITF02.00"	Legacy NITF Version 2.0 files.
"NITF02.10"	NITF Version 2.1 files.
"NSIF01.00"	NSIF Version 1.0 files.

Note: The intent is for "NITF02.10 and NSIF01.00" to be treated as aliases.

3.3 Compliance Level. The field previously called 'Compliance Level' is now called 'Complexity Level'. Whereas NITF2.0 was implemented with seven compliance level codes (01, 02, 03, 04, 05, 06, 99); NITF2.1 (NSIF1.0) will initially use four complexity level codes (03, 05, 06, 99). See **Table 1** below for the proposed complexity level summary.

3.4 Standard Type. The NITF2.0 System Type (STYPE) field was previously unused (always filled with spaces). This field has now been redesignated as the Standard Type (STYPE) field. For NITF2.1 and NSIF1.0 designated files, it will contain the version of ISO BIIF applicable to those profiles, i.e. BF01. To ease transition, implementations of NITF2.1/NSIF1.0 should be forgiving if this field is received with spaces rather than with 'BF01'.

3.5 Date and Time. The date and time field in the file header and segment subheaders has been modified to include century information to help cope with the year 2000 transition. To keep the field length the same as that used for NITF2.0, the month is designated as a numeric (01-12) vice an alphabetic (Jan - Dec) representation. The 'Z' indicator for UTC (ZULU) time is no longer included in the field, but all times are to be expressed using the UTC time zone. To ease transition, implementations of NITF2.1/NSIF1.0 shoudl be forgiving if this field is received in the legacy NITF2.0 format and properly interpret the date and time as needed within the application.

3.6 Security Downgrade Dates. To avoid modifying the field length, century information has not been added to the security downgrade fields. The dates in these fields must be interpreted in light of the century information contained in the corresponding date and time field of the header or subheader in which the security downgrade date is contained.

3.7 Block Shape and Size. In the past, NITF implementations were limited to only using square blocks in multi-blocked images. Additionally, allowable block sizes were constrained to discrete sizes (32x32, 64x64, ... 1024x1024). Block shapes can now be rectangular and of variable size across the ranges designated for each complexity level.

3.8 Image Coordinate System. The image coordinate system fields (ICORDS and IGEOLO) in the image segment subheader have been modified for improved clarity of use. The ICORDS code for not including the opitonal image coordinate fields (IGEOLO) has changed from 'N' to 'space'. This change results in a significant difference between NITF2.0 and NITF2.1. Implementors need to realize that this change impacts the traditional NITF1.1 and 2.0 logic as to when the IGEOLO fields appear and when they don't appear. The ICORDS code 'N' in NITF2.1 now signifies that there will be IGEOLO fields; where previously the code 'N' meant that IGEOLO fields were omitted. The ICORDS code of 'space' will now signify the IGEOLO fields are omitted.

3.9 Transparent Pixels. The concept of 'transparent pixel' has been renamed to 'pad pixel' to better reflect the intended concept. A new concept of designating a specific pixel value as being 'transparent' has been added. The proper interpretation and use of the 'Pad Pixel Mask Tables' is now required.

3.10 Blocked Image Mask Tables. The proper interpretation and use of the 'Blocked Image Mask Tables' is now required.

3.11 JPEG Compression. The structure of JPEG Application Markers has been modified to align with international profile registration constraints. NITF users will limit themselves to Application Data Segment #6 (aka Apps 6) to include image support in the JPEG stream. The individual App 6s will be identified by the a unique ID_string with a version label following the length field in the data segment. The first and required App6 segment will be identified by the string "NITF.". The Min-value/block data shall appear in App6"NITF0001.A", error correction codes shall in appear in App6"NITF0002.A", interim low bit rate header data shall appear in App6"NITF0004.A" and the block directory table values shall appear in App6NITF0003.A"

3.12 JPEG Compression (12-bit). All NITFS read capable implementations must now support 12-bit JPEG decompression of single band images.

3.13 VQ Decompression. All NITFS read capable implementations must now support decompression of Vector Quantization (VQ) compressed image segments.

3.14 USMTF Text Segments. The option to allow text segments containing U.S. Message Text Format (USMTF) structured text is now allowed for implementation. Of particular interest to many is the use of the GRAPHREP message series. Implementations must at least handle these text segments as currently done for plain ASCII text segments. Consideration should be given to provide the option to launch an USMTF capable application to act on the MTF data when included in the file.

4 NEW FEATURES AND CAPABILITIES

The following is a summary of features considered to be new to NITFS:

4.1 Universal Multiple Octet Coded Character Set (UCS). Although the character codes in header and subheader fields are still constrained to eight bit codes, the standard now allows the selection and use of UCS character set(s) within the text data field of the text segment.

4.2 Number of Bands. A new conditional field (5 bytes) has been established to allow for multi-spectral images of more than 9 bands. The presence of this new field is signified when the NBANDS field has a value of '0'.

4.3 Multiple 'Base' Images in a Single File. The NITF2.0 paradigm of only allowing a single base image per NITF file has been expanded. Through the appropriate placement of images within the common coordinate system and the proper association of attachment and display levels, the single file paradigm has been expanded to allow multiple base images, each with its own set of associated overlays.

4.4 Multiple File Products. NITFS products consisting of multiple cross correlated NITF files are now being produced (e.g. CADRG, CIB, DPPDB, files split at 2GB boundaries, Rsets, etc.) in NITF2.0 format. As a minimum, NITF2.0 interpreters were only expected to read single files from these products. NITF2.1 implementations should look toward full interpretation and user presentation of multiple file products, both in NITF2.0 and NITF2.1 formats. Further expansion of the multiple file product paradigm is anticipated.

4.5 Symbol Bounding Rectangles. Unused fields in the symbol subheader have been redefined to allow for definition of a virtual bounding rectangle within which all visible components of a CGM symbol are contained. [Current ballot version of BIIF does not provide for, nor allow for, this nominated feature of NITF2.1]

4.6 Symbol Color. The symbol color field has been redefined to express whether the CGM symbol is entirely monochrome or if it has color components.

4.7 Transport File Structure. A new Military Standard has been created defining the Transport File Structure for use within a Data Extension Segment (DES).

4.8 Caboose Extension Concept. An ability to allow initiation of NITF file transmission prior to having all the information needed to complete the file header has been added.

5 NITF EXTENSIONS

The following are the significant sets of NITF extensions that have been defined since the inception of NITF2.0. The general philosophy of the past has been that NITF extensions are optional for implementation. All readers of NITF files were required to at least skip past extension data when attempting to read files with such data. Implementors of NITF2.1 should give renewed consideration to whether their customer base would be better served if extensions were more robustly supported.

5.1 PIAE. The profile for imagery archive extensions (PIAEs) are used primarily to support the automatic archival and cataloging of imagery products. Any implementation with a requirement to feed imagery files to an imagery archive/library should support these extensions.

5.2 SDE. The Support Data Extensions (SDEs) provide data necessary for full interpretation and exploitation of national imagery.

5.3 Airborne EO/SAR/IR SDE. These SDE, currently in draft, provide data necessary for the interpretation and exploitation of imagery from airborne collectors.

5.4 RPF. The Raster Product Format (RPF) extensions allow for a more robust interpretation and representation of several geospacial products (CADRG and CIB).

5.5 DPPDB. Support for the Digital Point Positioning Data Base (DPPDB) extensions are essential for the proper interpretation and use of NITF formatted files produced in DPPDB products.

5.6 JPEG Post Processing. A set of post-processing tags included by some national production systems will allow for receipt of JPEG 12-bit per pixel compressed imagery products with improved image quality.

5.7 Geospacial Extensions. A set of Spatial Data Extensions has been added to the standard.

6 NITF2.0 PROFILE OF BIIF

The following is a summary of the differences between legacy NITF2.0 files and the BIIF standard that impact the possibility of creating an NITF2.0 profile of BIIF (if the community chooses to do such a thing) which is exactly binary compatible with legacy NITF2.0:

6.1 STYPE Field. NITF2.0 always placed four space characters in this field. A truly BIIF compliant file will have ‘BF10’ in this field. Existing NITF2.0 applications may need to be modified to ignore this field if populated with ‘BF10’. BIIF applications will need to be forgiving if this field is populated with spaces.

6.2 Date and Time Fields. The data and time representation in BIIF has been modified from that in NITF2.0 to include the century designation. Existing NITF2.0 applications will need to be modified to recognize the new date/time format. BIIF applications will need to be forgiving and recognize the legacy date/time format.

6.3 Conditional Field for Security Downgrade events. The optional fields for specifying downgrading events are not present in BIIF. There is no impact on

NITF2.0 applications receiving NITF2.0 profile BIIF files. BIIF applications receiving legacy NITF2.0 files will need to anticipate the existance of the conditional field, even though not specified in BIIF.

6.4 ICORDS Code N. For NITF2.0, code 'N' in the Image Coordinate System (ICORDS) field signifies that the optional fields for geolocation (IGEOLO) are not included in the file. For NITF2.1, code 'N' in the ICORDS field will signify that the IGEOLO fields are included and that they are for the northern hemisphere; a 'space' in the ICORDS field will signify that the IGEOLO fields are not present.

7 Label Segments. NITF2.0 systems would need to exclude label segments from files sent to NITF2.0 BIIF profile capable systems. Since it is the general practise of most NITF2.0 implementations to use CGM text (symbol segments) vice label segments, the potential for impact on field use is minimal.

PENDING ISSUES.

The following are areas of potential change for which resolution by the standards commitees is still pending:

7.1 Security Fields. The structure and content of security fields in BIIF is left open for definition by user profiles. In light of a recent Executive Order, the legacy structure and content of NITF1.1 and NITF2.0 security fields is being reviewed and may change.

7.2 Interim Low-Bit-Rate Compression. Work is being done to define an interim improved low-bit-rate compression approach based on JPEG to serve the imagery community until the next generation compresson technology is stabilized for standard implementation.

7.3 NITF CGM Profile. The legacy constraints on allowable CGM constructs are being reviewed for expansion and improved clarification for implementation options.

7.4 Formatted Text. Consideration is being given on how to best handle the inclusion and use of formatted text segments, e.g. word processing documents, SGML, HTML, etc.

7.5 Audio Segments. Consideration is being given to defining audio data extension segments as an imagery annotation type.

7.6 Video Segments. Consideration is being given to defining video data extension segments as an imagery annotation type.

TABLE 1 - PROPOSED COMPLEXITY LEVEL SUMMARY